BS EN 61954:2011+A2:2017

BSI Standards Publication

Static VAR compensators (SVC) - Testing of thyristor valves

bsi.

National foreword

This British Standard is the UK implementation of EN 61954:2011, incorporating amendment A1:2013 and including amendment A2:2017. It is identical to IEC 61954:2011, incorporating amendment 1:2013 and including amendment 2:2017. It supersedes BS EN 61954:2011+A1:2013, which will be withdrawn on 17 May 2020.

The start and finish of text introduced or altered by IEC amendment 1 is indicated in the text by tags.

The text of IEC amendment 2:2017 has been provided in its entirety at the beginning of this document. BSI's policy of providing consolidated content remains unchanged; however, in the interest of expediency, in this instance BSI have chosen to collate the relevant content at the beginning of this document.

The UK participation in its preparation was entrusted to Technical Committee PEL/22, Power electronics.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 July 2011.

Amendments/corrigenda issued since publication

Date	Text affected
31 October 2013	Implementation of IEC amendment 1:2013 with CENELEC endorsement A1:2013
31 March 2018	Implementation of IEC amendment 2:2017 with CENELEC endorsement A2:2017

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61954

June 2011

ICS 29.240.99; 31.080.20

Supersedes EN 61954:1999 + A1:2003

English version

Static VAR compensators (SVC) - Testing of thyristor valves

(IEC 61954:2011)

Compensateurs statiques de puissance réactive (SVC) - Essais des valves à thyristors (CEI 61954:2011)

Static VAR compensators (SVC) - Testing of thyristor valves (IEC 61954:2011)

This European Standard was approved by CENELEC on 2011-05-26. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 61954:2011 E

Foreword

The text of document 22F/217/CDV, future edition 2 of IEC 61954, prepared by SC 22F, Power electronics for electrical transmission and distribution systems, of IEC TC 22, Power electronic systems and equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61954 on 2011-05-26.

This European Standard supersedes EN 61954:1999 + A1:2003.

EN 61954 :2011 includes the following significant technical changes with respect to EN 61954:1999 + A1:2003:

a) Definitions of terms “thyristor level”, “valve section”, “valve base electronics” and ”redundant thyristor levels” have been changed for clarification.

b) Conditions of testing thyristor valve sections instead of a complete thyristor valve have been defined.

c) The requirement has been added that if, following a type test, one thyristor level has become short-circuited, then the failed level shall be restored and this type test repeated.

d) The time period of increasing the initial test voltage from 50 % to 100 % during type a.c. dielectric tests on TSC, TCR or TSR valves has been set equal to approximately 10 s.

e) The duration of test voltage U_{ts2} during type a.c.-d.c. dielectric tests between TSC valve terminals and earth as well as the duration of test voltage U_{tvv2} during dielectric tests between TSC valves (for MVU only) has been changed from 30 min to 3 h.

f) The reference on the number of pulses per minute of the periodic partial discharge recorded during a.c.-d.c. dielectric tests on TSC valves and exceeding the permissible level has been deleted.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2012-02-26
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2014-05-26

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61954:2011 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60060	Series	High-voltage test techniques	EN 60060	Series
IEC 60060-1	-	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	-
IEC 60060-2	-	High-voltage test techniques - Part 2: Measuring systems	EN 60060-2	-
IEC 60071	Series	Insulation co-ordination	EN 60071	Series
IEC 60071-1	2006	Insulation co-ordination - Part 1: Definitions, principles and rules	EN 60071-1	2006
IEC 60270	-	High-voltage test techniques - Partial discharge measurements	EN 60270	-
IEC 60700-1	2008	Thyristor valves for high voltage direct current (HVDC) power transmission – Part 1: Electrical testing	-	-

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61954/A1

September 2013

ICS 29.240.99; 31.080.20

English version

Static VAR compensators (SVC) - Testing of thyristor valves
(IEC 61954:2011/A1:2013)

Compensateurs statiques de puissance réactive (SVC) -
Essais des valves à thyristors
(CEI 61954:2011/A1:2013)

Statische Blindleistungskompensatoren (SVC) -
Prüfung von Thyristorventilen
(IEC 61954:2011/A1:2013)

This amendment A1 modifies the European Standard EN 61954:2011; it was approved by CENELEC on 2013-05-31. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

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CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 61954:2011/A1:2013 E

Foreword

The text of document 22F/274/CDV, future IEC 61954:2011/A1, prepared by SC 22F, "Power electronics for electrical transmission and distribution systems", of IEC TC 22, "Power electronic systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61954:2011/A1:2013.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2014-03-27
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2016-05-31

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61954:2011/A1:2013 was approved by CENELEC as a European Standard without any modification.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61954:2011/A2

July 2017

ICS 31.080.20; 29.240.99

English Version

Static VAR compensators (SVC) - Testing of thyristor valves (IEC 61954:2011/A2:2017)

Compensateurs statiques de puissance réactive (SVC) - Essais des valves à thyristors (IEC 61954:2011/A2:2017)

Statische Blindleistungskompensatoren (SVC) - Prüfung von Thyristorventilen (IEC 61954:2011/A2:2017)

This amendment A2 modifies the European Standard EN 61954:2011; it was approved by CENELEC on 2017-05-17. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

The text of document 22F/409/CDV, future IEC 61954:2011/A2, prepared by SC 22F "Power electronics for electrical transmission and distribution systems" of IEC/TC 22 "Power electronic systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61954:2011/A2:2017.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2018-02-17
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2020-05-17

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61954:2011/A2:2017 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)
Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Addition:

Publication	Year	Title	EN/HD	Year
IEC 60071-1	2006	Insulation co-ordination -- Part 1: Definitions, principles and rules	EN 60071-1	2006
+ A1	2010		+ A1	2010

Replace IEC 60700-1:2008 by:

IEC 60700-1	2015	Thyristor valves for high voltage direct current (HVDC) power transmission -- Part 1: Electrical testing	EN 60700-1	2015

IEC 61954

Edition 2.0 2017-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 2
AMENDEMENT 2

Static var compensators (SVC) – Testing of thyristor valves

Compensateurs statiques de puissance réactive (SVC) – Essais des valves à thyristors

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
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FOREWORD

This amendment has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronic systems and equipment.

The text of this amendment is based on the following documents:

CDV	Report on voting
22F/409/CDV	22F/418A/RVC

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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2 Normative references

Replace reference "IEC 60071-1:2006, *Insulation co-ordination – Part 1: Definitions, principles and rules" by*

"IEC 60071-1:2006, *Insulation co-ordination – Part 1: Definitions, principles and rules* IEC 60071-1:2006/AMD1:2010"

Replace, in the last reference, "IEC 60700-1:2008" *by* "IEC 60700-1:2015".

4.2.6 Optional tests

Replace, in the existing paragraph, the text "operational tests specified in 4.2.2" *by* "operational tests specified in 4.2.3".

4.4.1.1 Dielectric test objects

Delete, in the first paragraph, the last sentence.

4.5 Permissible component failures during type testing

Replace, in the third paragraph, the text "(see 4.4.1b) in IEC 60700-1, Amendment 1)" *by* "(see 4.4.2 b) in IEC 60700-1:2015)".

Table 2 – Number of thyristor levels permitted to fail during type tests

Replace, in the third row of the first column, "34 < n < 68" *by* "34 ≤ n < 68".

Replace, in the fourth row of the first column, "68 < n < 101" *by* "68 ≤ n < 101".

5.1.2.1 Objectives

Replace "See 4.2.2.1" *by* "See 4.2.2.2".

5.1.3.1 Objectives

Replace "See 4.2.2.1" *by* "See 4.2.2.2".

5.2.2.1 Objectives

Replace "See 4.2.2.1" *by* "See 4.2.2.2".

5.2.3.1 Objectives

Replace "See 4.2.2.1" *by* "See 4.2.2.2".

5.3.2.1 Objectives

Replace "See 4.2.2.2" *by* "See 4.2.2.3".

5.3.3.1 Objectives

Replace "See 4.2.2.2" *by* "See 4.2.2.3".

6.1.2.1 Objectives

Replace "See 4.2.2.1" *by* "See 4.2.2.2".

6.1.3.1 Objectives

Replace "See 4.2.2.1" *by* "See 4.2.2.2".

6.2.2.1 Objectives

Replace "See 4.2.2.1" *by* "See 4.2.2.2".

6.2.3.1 Objectives

Replace "See 4.2.2.1" *by* "See 4.2.2.2".

6.3.2.1 Objectives

Replace "See 4.2.2.2" *by* "See 4.2.2.3".

6.3.3.1 Objectives

Replace "See 4.2.2.2" *by* "See 4.2.2.3".

7.2.2 Switching impulse test

Replace, in the first paragraph, the text "5.3.3.1 and 6.3.2.1, respectively" *by* "5.3.3 and 6.3.3, respectively".

10.2.1 Objectives

Replace, in the note, the words "overcurrent test" *by* "overcurrent tests".

10.2.2 Test values and waveshapes

b) Valve with no protection provided

Replace, in the key to the equation, modified by IEC 61954:2011/AMD1:2013, the text "is the switching impulse prospective voltage level according to IEC 60071-1, Table 3, or as determined by insulation coordination studies" *by* "is the switching impulse as determined by insulation coordination studies".

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CONTENTS

STATIC VAR COMPENSATORS (SVC) – TESTING OF THYRISTOR VALVES

1 Scope

This International Standard defines type, production and optional tests on thyristor valves used in thyristor controlled reactors (TCR), thyristor switched reactors (TSR) and thyristor switched capacitors (TSC) forming part of static VAR compensators (SVC) for power system applications. The requirements of the standard apply both to single valve units (one phase) and to multiple valve units (several phases).

Clauses 4 to 7 detail the type tests, i.e. tests which are carried out to verify that the valve design meets the requirements specified. Clause 8 covers the production tests, i.e. tests which are carried out to verify proper manufacturing. Clauses 9 and 10 detail optional tests, i.e. tests additional to the type and production tests.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060 (all parts), *High-voltage test techniques*

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60060-2, *High-voltage test techniques – Part 2: Measuring systems*

IEC 60071 (all parts), *Insulation co-ordination*

IEC 60071-1:2006, *Insulation co-ordination – Part 1: Definitions, principles and rules*

IEC 60270, *High-voltage test techniques – Partial discharge measurements*

IEC 60700-1:2008, *Thyristor valves for high-voltage direct current (HVDC) power transmission – Part 1: Electrical testing*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply:

3.1
thyristor level
part of a thyristor valve comprising a thyristor, or thyristors connected in parallel or antiparallel, together with their immediate auxiliaries and reactor, if any

3.2
thyristor (series) string
series connected thyristors forming one direction of a thyristor valve